

SECTION 7 - SYSTEM ANALYSIS RESULTS

OVERVIEW

GEM was run to estimate the total transportation cost savings (NED benefits) attributable to the with and without-project conditions. The model was used to estimate the benefits to the existing and improved systems for calendar years 1992, 2000, 2010, 2020, 2030, 2040, and 2060. For intermediate years, the system transportation benefits are estimated by assuming a constant change in benefits between the years explicitly modeled.

WITHOUT-PROJECT CONDITIONS

Table 7 - 1 summarizes the results of the without-project GEM runs. Displayed are the annual tonnages and expected levels of delay for modeled system locks. Annual tonnage moved on the entire system as well as the annual net transportation cost savings of the system. (Note that system tonnage does not include tonnage that does not transit at least one of the modeled IWW locks.) The following paragraphs are observations regarding the model results for the without-project condition.

The GEM estimates of system and lock traffic for the existing 1992 conditions agreed with observed data. GEM showed 80.3 million tons of total traffic in the modeled system compared with the WCSC tonnage estimate of 80.3 million tons (adjusted for the deletion of "small" and negative gross cost savings movements).

Table 7 – 2 provides the basis for comparing "actual" 1992 traffic with the model results by lock. When compared to recorded results for 1992 the GEM results are quite reasonable estimates. The last column shows the difference between GEM and "actual" 1992 tonnages by lock. Given "non-optimal" actual behavior, the fact that "actual" tonnages are themselves only estimates for certain routes, the assignment of transportation costs to the population of movements from the actually costed movements in the sample, the approximation in delay function estimation, and the loss of some detail in the aggregation of the movement file, the results generated by GEM represent a high degree of calibration of the model for this study where emphasis is on the Bayou Sorrel Lock.

WITH-PROJECT CONDITIONS

The with-project scenarios consist of two larger Bayou Sorrel lock sizes built as a concrete structure or an earthen structure. Focusing on the Bayou Sorrel Lock, tables 7 - 3 through 7 - 8 display the average delay, traffic processed, and transportation cost savings results of the GEM runs for each of these scenarios, including the without-project condition, by the future years specified above. The following paragraphs are observations regarding the model results.

Table 7 - 3 shows the GEM estimates of average delay per tow for the without-project and the four with-project conditions. For the new lock construction alternatives, table 7 – 3 shows a sufficiently large outward shift in the delay function resulting in much lower delays at Bayou Sorrel lock throughout the period of analysis.

Table 7 - 4 shows the traffic accommodated, or processed, at the Bayou Sorrel lock. Table 7 - 5

Table 7 - 1

Without Project Conditions
Tonnage and Delay by Lock

Lock	1992		2000		2010		2020	
	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)
Old River	7,822	0.15	9,168	0.18	11,178	0.23	17,587	0.45
Port Allen	23,244	1.20	26,650	1.82	30,152	3.08	30,395	3.22
Bayou Sorrel	22,554	2.32	25,817	4.25	29,170	12.74	29,287	15.03
IHNC	20,830	6.31	25,071	20.33	25,976	32.79	26,158	37.20
Algiers	21,837	2.37	22,262	2.64	23,767	4.17	25,028	7.35
Harvey	3,797	0.62	4,317	0.75	6,204	1.46	8,473	3.44
Bayou Boeuf	25,915	1.24	26,967	1.42	29,780	2.09	33,238	3.95
Leland Bowman	40,533	0.32	44,348	0.36	50,964	0.44	58,725	0.55
Calcasieu	40,359	1.53	43,853	1.75	50,258	2.21	57,890	2.90
Total Tons (Ktons)	80,301		88,683		97,598		107,602	
Total Net Benefits (millions \$)	824.2		862.1		929.2		1,036.5	
Savings per Ton (Kton)	10.26		9.72		9.52		9.63	
Lock	2030		2040		2060		2060	
	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)
Old River	26,479	1.01	37,820	3.79	44,467	93.49		
Port Allen	30,689	3.39	31,341	3.85	32,687	5.22		
Bayou Sorrel	29,438	17.53	29,927	28.90	30,649	114.57		
IHNC	26,158	37.20	26,397	45.00	26,619	55.60		
Algiers	25,966	15.29	26,414	29.90	26,767	110.42		
Harvey	10,393	10.94	11,041	25.09	11,461	104.98		
Bayou Boeuf	36,002	9.66	36,667	14.11	36,702	14.46		
Leland Bowman	68,039	0.70	78,844	0.92	84,912	1.07		
Calcasieu	67,054	4.03	77,707	6.08	83,950	7.98		
Total Tons	119,209		132,211		142,229			
Total Net Benefits (millions \$)	1,149.1		1,231.3		989.4			
Savings per Ton	9.64		9.31		6.96			

Table 7 - 2

**Comparison of Reported 1992 Traffic and GEM Results
(1,000 Tons)**

Lock	WCSC	Deleted Negative GRS Movements	Deleted "Small" Movements	"Actual" 1992	GEM Results	GEM Differences
Old River	8,018	31	2	7,985	7,822	(163)
Port Allen	22,571	83	19	22,469	23,244	775
Bayou Sorrel	21,984	83	21	21,880	22,554	674
IHNC	21,419	523	38	20,858	20,830	(28)
Algiers	21,891	1	24	21,866	21,837	(29)
Harvey	4,000	18	23	3,958	3,797	(161)
Bayou Boeuf	25,581	20	46	25,515	25,915	400
Leland Bowman	40,702	112	57	40,533	40,533	(0)
Calcasieu	40,506	95	53	40,359	40,359	0

Table 7 - 3

**Bayou Sorrel Lock Average Delays
By Alternative and Year
(Hours)**

Condition	1992	2000	2010	2020	2030	2040	2060
Without Project	2.3	4.3	12.7	15.0	17.5	28.9	114.6
1200 x 75 Concrete Chamber	0.6	0.7	0.9	1.2	1.2	1.2	1.3
1200 x 75 Earthen Chamber	0.6	0.8	1.2	1.6	1.8	2.0	2.0
1200 x 110 Concrete Chamber	0.4	0.4	0.6	0.7	0.7	0.7	0.7
1200 x 110 Earthen Chamber	0.4	0.4	0.6	0.7	0.7	0.7	0.8

Table 7 - 4

**Bayou Sorrel Traffic Accommodated
By Alternative and Year
(1,000 Tons)**

Condition	1992	2000	2010	2020	2030	2040	2060
Without Project	22,554	25,817	29,170	29,287	29,438	29,927	30,649
1200 x 75 Earthen	22,876	25,817	29,170	34,231	34,382	34,649	35,193
1200 x 75 Concrete	22,890	26,215	30,662	34,285	34,444	34,690	35,195
1200 x 110 Earthen	23,005	26,227	30,735	34,336	34,472	34,711	35,196
1200 x 110 Concrete	23,005	26,227	30,735	34,339	34,475	34,713	35,196

expresses these same traffic volumes as a percent of total unconstrained demand. Table 7 - 6 displays similar information, but in the form of unaccommodated traffic levels. Tables 7 - 5 and 7 - 6 demonstrate that in the early years accommodated traffic was greater than total demand for the without-project and with-project alternatives. This result is due to the fact that GEM had routed some movements onto the Port Allen – Morgan City alternate route that originally did not use the alternate route because these movements alternate route transportation costs were less expensive than the original route. Tables 7 - 5 and 7 - 6 also show that in the later years, a large proportion of total demand is not accommodated in the without-project condition and, although less so, in the with-project conditions as well. The reason why this affect occurs in the with-project conditions is because nearly 100 percent of Bayou Sorrel lock traffic also passes through Port Allen lock. Consequently even though improvements at Bayou Sorrel lock decrease its traffic overall delay costs, it still has to incur high delays at Port Allen lock.

Table 7 - 7 compare the system tonnage processed in the with and without project conditions. Presented are the without-project tonnages at each system lock and project-induced changes in traffic, by lock, by year, for the various improved conditions.

Table 7 - 8 displays the total system transportation savings by year for the without-project condition and the total system and incremental transportation savings by year for each with-project alternative. System transportation cost savings represent the total transportation cost savings attributable to the entire modeled system network. Incremental transportation cost savings represent the portion of total system transportation cost savings attributable to the potential improvement under consideration (measured as the difference between with and without-project total transportation cost savings).

Table 7 - 5

**Bayou Sorrel Lock Percent of Total Demand Accomodated
By Alternative and Year**

Condition	1992	2000	2010	2020	2030	2040	2060
Without Project	103%	103%	98%	85%	73%	63%	46%
1200 x 75 Earthen	105%	103%	98%	99%	85%	73%	53%
1200 x 75 Concrete	105%	104%	103%	99%	85%	73%	53%
1200 x 110 Earthen	105%	104%	103%	99%	85%	73%	53%
1200 x 110 Concrete	105%	104%	103%	99%	85%	73%	53%

Table 7 - 6

**Bayou Sorrel Lock Traffic Unaccommodated
By Alternative and Year**

Condition	1992	2000	2010	2020	2030	2040	2060
Without Project	(674)	(708)	556	5,361	11,111	17,622	35,934
1200 x 75 Earthen	(996)	(708)	556	417	6,167	12,900	31,390
1200 x 75 Concrete	(1,010)	(1,106)	(936)	363	6,105	12,859	31,388
1200 x 110 Earthen	(1,125)	(1,118)	(1,009)	312	6,077	12,838	31,387
1200 x 110 Concrete	(1,125)	(1,118)	(1,009)	309	6,074	12,836	31,387

Table 7 - 7

**Changes In System Traffic
By Alternative and Year
(1,000 Tons)**

<u>Lock</u>	W/O Project Traffic	1200 x 75 Earthen	1200 x 75 Concrete	1200 x 110 Earthen	1200 x 110 Concrete
<u>1992</u>					
Old River	7822	-2	-2	-2	-2
Port Allen	23244	322	336	451	451
Bayou Sorrel	22554	322	336	451	451
IHNC	20830	0	0	0	0
Algiers	21837	-127	-131	-228	-230
Harvey	3797	-193	-203	-221	-219
Bayou Boeuf	25915	-321	-335	-450	-450
Leland Bowman	40533	0	0	0	0
<u>Calcasieu</u>	<u>40359</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total System	80301	0	0	0	0
<u>2000</u>					
Old River	9168	0	-2	-2	-2
Port Allen	26650	205	398	410	410
Bayou Sorrel	25817	204	398	410	410
IHNC	25071	0	0	0	0
Algiers	22262	-72	-151	-155	-155
Harvey	4317	-134	-246	-253	-253
Bayou Boeuf	26967	-204	-395	-407	-407
Leland Bowman	44348	0	0	0	0
<u>Calcasieu</u>	<u>43853</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total System	88683	0	0	0	0
<u>2010</u>					
Old River	11178	-619	-619	-619	-619
Port Allen	30152	1466	1480	1553	1553
Bayou Sorrel	29170	1478	1492	1565	1565
IHNC	25976	0	0	0	0
Algiers	23767	-207	-210	-227	-227
Harvey	6204	-639	-650	-706	-706
Bayou Boeuf	29780	-225	-239	-312	-312
Leland Bowman	50964	0	0	0	0
<u>Calcasieu</u>	<u>50258</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total System	97598	0	0	0	0

Table 7 - 7 (cont.)

**Changes In System Traffic
By Alternative and Year
(1,000 Tons)**

<u>Lock</u>	<u>W/O Project Traffic</u>	<u>1200 x 75 Earthen</u>	<u>1200 x 75 Concrete</u>	<u>1200 x 110 Earthen</u>	<u>1200 x 110 Concrete</u>
<u>2020</u>					
Old River	17587	-4638	-4697	-4741	-4744
Port Allen	30395	4930	4985	5036	5038
Bayou Sorrel	29287	4944	4998	5049	5052
IHNC	26158	0	0	0	0
Algiers	25028	-75	-870	-75	-75
Harvey	8473	-217	-213	-218	-218
Bayou Boeuf	33238	-98	-103	-96	-96
Leland Bowman	58725	0	0	0	0
<u>Calcasieu</u>	<u>57890</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total System	107602	0	0	0	0
<u>2030</u>					
Old River	26479	-4817	-4872	-4900	-4903
Port Allen	30689	4944	4991	5019	5022
Bayou Sorrel	29438	4944	5006	5034	5037
IHNC	26158	0	0	0	0
Algiers	25966	-44	-41	-41	-41
Harvey	10393	-74	-70	-70	-70
Bayou Boeuf	36002	-95	-87	-87	-87
Leland Bowman	68039	7	7	7	7
<u>Calcasieu</u>	<u>67054</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>
Total System	119209	24	24	24	24
<u>2040</u>					
Old River	37820	-3647	-3655	-3676	-3678
Port Allen	31341	4722	4744	4765	4767
Bayou Sorrel	29927	4722	4763	4784	4786
IHNC	26397	0	0	0	0
Algiers	26414	-130	-136	-136	-136
Harvey	11041	-165	-172	-173	-173
Bayou Boeuf	36667	-45	-46	-48	-48
Leland Bowman	78844	175	175	175	175
<u>Calcasieu</u>	<u>77707</u>	<u>175</u>	<u>175</u>	<u>175</u>	<u>175</u>
Total System	132211	767	767	767	767

Table 7 - 7 (cont.)

**Changes In System Traffic
By Alternative and Year
(1,000 Tons)**

<u>Lock</u>	<u>W/O Project Traffic</u>	<u>1200 x 75 Earthen</u>	<u>1200 x 75 Concrete</u>	<u>1200 x 110 Earthen</u>	<u>1200 x 110 Concrete</u>
<u>2060</u>					
Old River	44457	-43	-43	-43	-43
Port Allen	32687	4244	4246	4247	4247
Bayou Sorrel	30649	4544	4546	4547	4547
IHNC	26619	69	69	69	69
Algiers	26767	-16	-16	-16	-16
Harvey	11461	-16	-16	-16	-16
Bayou Boeuf	36702	-6	-5	-5	-5
Leland Bowman	84912	3779	3781	3782	3782
<u>Calcasieu</u>	<u>83950</u>	<u>3421</u>	<u>3421</u>	<u>3421</u>	<u>3421</u>
Total System	142229	4101	4103	4104	4104

Table 7 - 8

**Total and Incremental Transportation Savings
(1997 Prices)**

<u>Condition</u>	1992	2000	2010	2020	2030	2040	2060
Without Project	824,183,381	862,063,573	929,246,883	1,036,538,458	1,149,063,115	1,231,283,916	989,377,207
1200 x 75 Earthen	826,355,585 2,172,204	866,979,701 4,916,128	947,611,316 18,364,433	1,041,286,918 4,748,460	1,154,547,836 5,484,721	1,259,617,923 28,334,007	1,042,848,369 53,471,162
1200 x 75 Concrete	826,457,395 2,274,014	867,222,359 5,158,786	948,100,972 18,854,089	1,041,271,959 4,733,501	1,154,412,552 5,349,437	1,260,544,837 29,260,921	1,042,716,386 53,339,179
1200 x 110 Earthen	826,771,039 2,587,658	867,600,587 5,537,014	948,671,410 19,424,527	1,041,301,979 4,763,521	1,154,654,876 5,591,761	1,260,572,911 29,288,995	1,042,624,878 53,247,671
1200 x 110 Concrete	826,763,125 2,579,744	867,600,587 5,537,014	948,693,145 19,446,262	1,041,302,365 4,763,907	1,154,653,449 5,590,334	1,260,575,999 29,292,083	1,042,614,677 53,237,470